Marine Functional Assessment – Review of Available Methodologies

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MFA Purpose and Need

- Assess existing ecological functions in areas of interest
- Assess ecological functions following project construction
- Evaluate ecological lift from potential mitigation options

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Desirable Attributes of MFA Method

- Existing method
  - Based on BAS
  - Addresses variety of ecological functions in single currency
- Developed for/readily adaptable to AK coastal regions
  - Must address important ecological functions in LCI habitats
- Published/previously used in AK marine applications
- Method that can use existing data from areas of interest (no extensive new field work needed)
- Method that produces consistent and repeatable results

Puget Sound Habitat Assessment Methodology

- Rated (by consensus) level of function (L,M,H) of small areas of habitat for:
  - Juvenile salmonids
  - Bivalves
  - Dungeness crab
  - Flatfish
  - Shorebirds
  - Waterfowl
- Scored 1, 2, 3
- Summed by area X function score

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Puget Sound Habitat Assessment Methodology

- Pros
  - Simple to use, transparent
  - Used with agency concurrence to assess mitigation needs for CERCLA cleanup
- Cons
  - Addressed limited number of functions
  - Used only BPJ to rate habitats
  - Did not cover all habitat types in LCI
  - Did not cover all ecological functions in LCI
  - Not published – even in gray literature
  - Not used in Alaska

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Anchorage Debit-Credit Method

- Assigns Relative Ecological Value (REV (1=high, to 4=low) to various habitat types
- Maps area potentially impacted and multiplies area X REV to get mitigation debit
- Same process in reverse to assess ecological lift

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Anchorage Debit-Credit Method

- Pros
  - Developed for use in AK by agency group
  - Simple formulae provide the answer
- Cons
  - Not a functional assessment (but reflects our understanding of how habitats function)
  - Low resolution for multiple habitat types
    - All intertidal REV=1 or 2; all subtidal REV=2 or 3
  - Does not distinguish among habitat types in LCI (eelgrass, kelp beds)
  - Lacks sensitivity to show any ecological lift

Tidal Habitat Model (SEWIP)

- Indicator Value Assessment (IVA)
- Study area broken into Assessment Areas (AA) based habitat homogeneity
- Field determination of presence/absence of 34 indicators of habitat function for juvenile salmonids
  - e.g., substrate, slope, vegetation, fw input, channels, riparian condition
- Model scores and combines these indicators using weightings established by agency team based on BAS
- Currency is IVA-acres (score X area of AA)

Tidal Habitat Model (SEWIP)

- Pros
  - Developed by agency team
  - Codified in local land use regulation
  - Simple to use
- Cons
  - Salmon-centric
  - Did not cover all habitat types in LCI (rocky)
  - Not used in Alaska

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WESPAK-SE

(Wetland Ecosystem Services Protocol for Southeast Alaska)

- Resembles IVA approach:
  - Study area is broken into AA
  - A field questionnaire (rapid assessment) is used to define characteristic attributes of each AA
- A series of models, parameterized using BAS and BPJ are used to rate processes and functions of habitat sub-types within the AA
- Individual scores are generated for each of 11 functions or values within the AA
- A single overall score is generated for each AA

WESPAK-SE

(Wetland Ecosystem Services Protocol for Southeast Alaska)

- Pros
  - Developed for AK with agency participation
  - Field tested on marine wetlands in SE
  - Based on BAS and BPJ
- Cons
  - Does not cover all habitats/functions of concern in LCI (Substantial effort to adapt)
  - Not particularly transparent
  - Approach is geared to large scale changes in wetlands

NWI Plus Methodology

- Based on freshwater NWI system – aerial photographic and GIS interpretation
- NWI Classes of wetlands (that include ecosystem, vegetation type, substrate type) are assigned hydrogeomorphic characteristics (LLWW)
  - LLWW = landscape position, landform, water flow path, and waterbody type

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NWI Plus Methodology

- Based on BPJ/literature
  - Assigns High, Medium, or Low rating for 11 functions to each NWI-LLWW Wetland/Marine Habitat
- Can be expanded to include more functions for marine ecosystem

NWI Plus Methodology

- Pros
  - Developed by federal agency
  - Simple to use, transparent
  - Similar to method used for freshwater FA
  - Uses BPJ/literature to rate habitats
  - Results in qualitative functional ratings

- Cons
  - Addresses limited number of functions for marine habitats in LCI
  - Does not cover all habitat types in LCI
  - Not previously used for marine application in Alaska
  - Substantial modification/additional data would be needed to apply to marine habitat in LCI
  - H, M, L categories lack sensitivity to assess impacts or ecological lift from potential mitigation actions

Habitat Equivalency Analysis (HEA)

- Developed by NOAA (1977) for use in assessing habitat injury and required compensatory mitigation in NRDA Superfund and oil spill cases; numerous applications in oil spills and chronic sediment contamination
- Suggested for use by Corps (Ray 2007)
- Used by NMFS (2008) as currency in habitat conservation banking in Puget Sound
- Used by FAA (2010) to assess mitigation needs from Sitka Airport Expansion
- Used by CBS to assess mitigation needs for Blue Lake Hydroelectric project expansion (freshwater)

Habitat Equivalency Analysis (HEA)

- Assessing the unavoidable impacts of the project on local marine habitats and resources (debits, but also credits)
- Defining, in equivalent units, the:
  - Functions lost in project footprint
  - Functions provided by the expansion of rocky habitat in the project area
  - Functions provided by mitigation that will be provided by each potential mitigation action (credits, but also debits)
- "How much mitigation is needed to provide adequate compensation for the loss of ecological functions of impacted marine waters, resources, and habitat?"

Habitat Equivalency Analysis (HEA)

- Study area habitat mapping
  - Footprint/substrate of all project facilities and potential mitigation areas
- Use table (based on BAS and BPJ) of relative habitat function (RHF) for all habitats and functions of concern
- Area X RHF = Habitat Functional Area (HFA) (the currency of debits/credits)

Habitat Equivalency Analysis (HEA)

- Pros
  - Developed by agencies, modified w. agency participation for use in AK
  - Developed to address habitats and functions present in LCI
  - Habitat ratings based on BAS and BPJ
  - Transparent
- Cons
  - Only one marine application to date in AK

Summary Comparison

- Qualitative comparison of all methods considered
- Expanded set of evaluation factors (similar to terrestrial and stream)
- Major differences centered on ease of application to marine environment and prior use in AK

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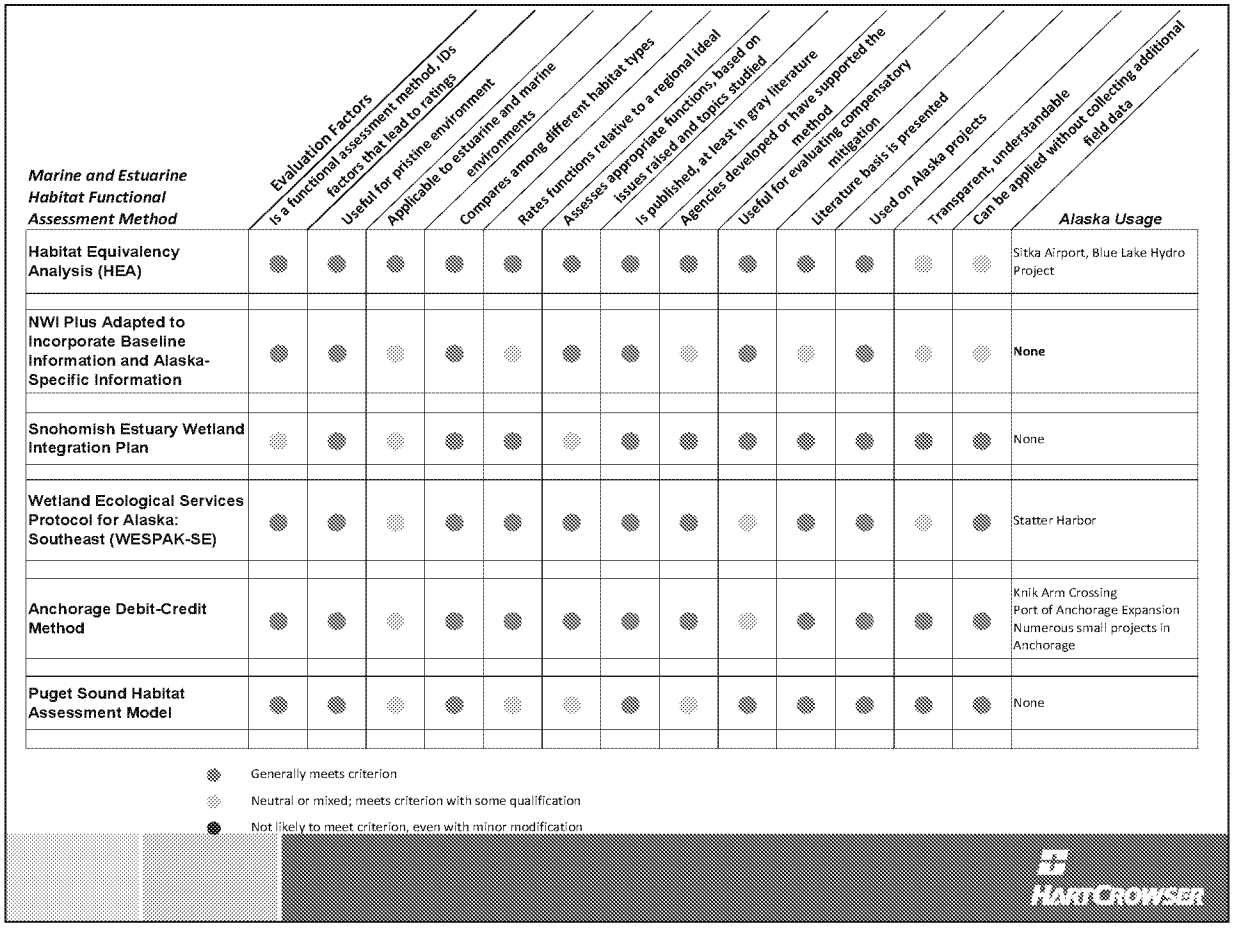
Evaluation Factors
Is a functional assessment method, IDs factors that lead to ratings
Useful for pristine environment
Applicable to estuarine and marine environments
Compares among different habitat types
Rates functions relative to a regional ideal
Assesses appropriate functions, based on issues raised and topics studied
Is published, at least in gray literature
Agencies developed or have supported the method
Useful for evaluating compensatory mitigation
Literature basis is presented
Used on Alaska projects
Transparent, understandable
Can be applied without collecting additional field data
Marine and Estuarine Habitat Functional Assessment Method
Alaska Usage
Habitat Equivalency Analysis (HEA)
Sitka Airport, Blue Lake Hydro Project
NWI Plus Adapted to Incorporate Baseline Information and Alaska-Specific Information
None
Snohomish Estuary Wetland Integration Plan
None
Wetland Ecological Services Protocol for Alaska: Southeast (WESPAK-SE)
Statter Harbor
Anchorage Debit-Credit Method
Knik Arm Crossing
Port of Anchorage Expansion
Numerous small projects in Anchorage
Puget Sound Habitat Assessment Model
None
Generally meets criterion
Neutral or mixed; meets criterion with some qualification
Not likely to meet criterion, even with minor modification
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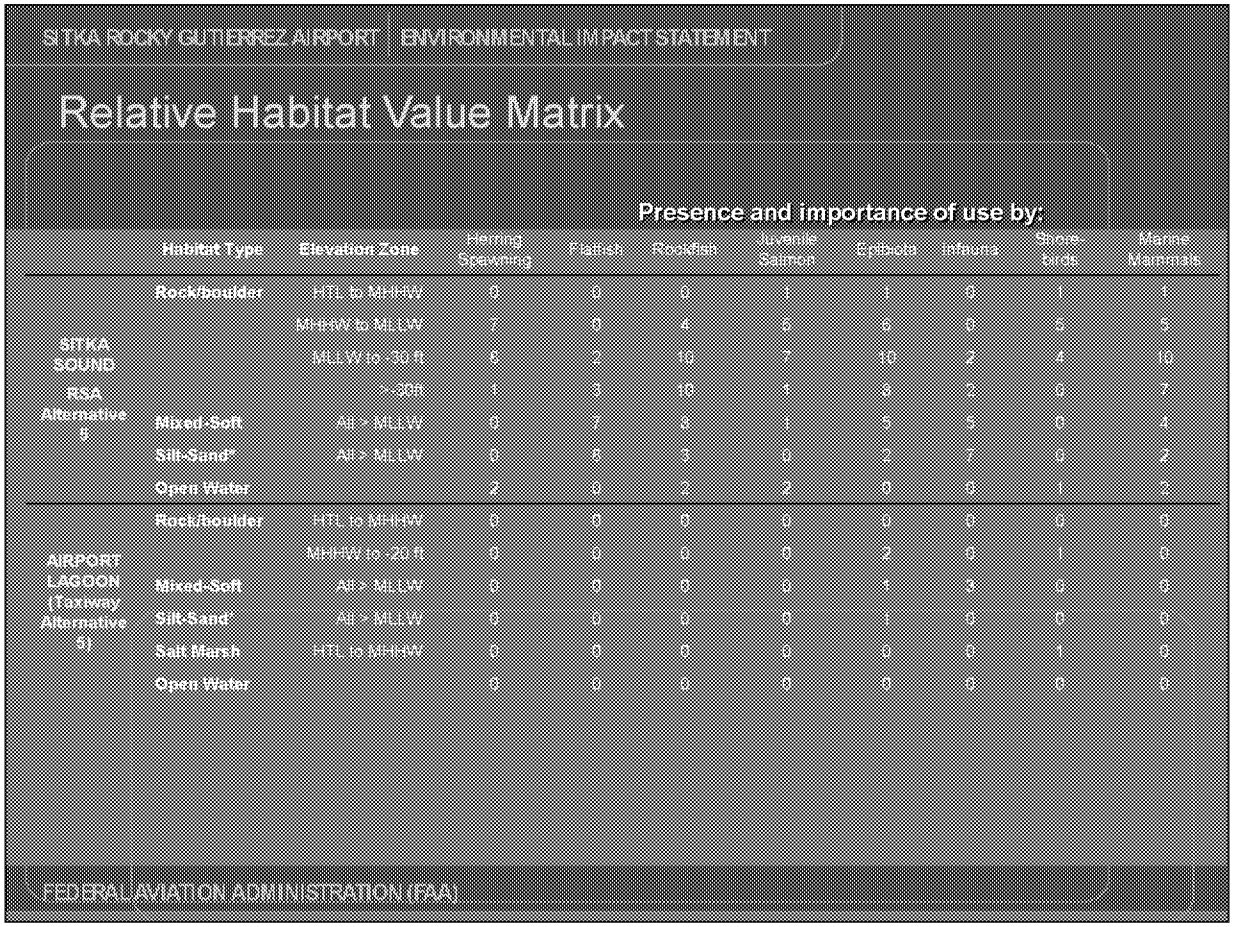
SITKA ROCKY GUTIERREZ AIRPORT | ENVIRONMENTAL IMPACT STATEMENT
Relative Habitat Value Matrix
Presence and importance of use by:
Habitat Type
Elevation Zone
Herring Spawning
Halibut
Rockfish
Juvenile Salmon
Eelgrass
Influms
Shore-birds
Marine Mammals
SITKA SOUND
RSA Alternative 9
Rock/Boulder
HTL to MHHW
0 0 0 1 1 0 1 1
MHHW to MLLW
7 0 4 5 0 0 5 5
MLLW to -30 ft
6 3 10 7 10 2 4 10
> 30ft
1 3 10 1 5 2 5 7
Mixed-Soft
All > MLLW
0 7 8 1 5 5 0 4
Silt-Sand
All > MLLW
0 5 3 0 2 7 0 2
Open Water
2 0 3 2 0 0 1 2
AIRPORT LAGOON (Taxiway Alternative 9)
Rock/Boulder
HTL to MHHW
0 0 0 0 0 0 0 0
MHHW to -30 ft
0 0 0 0 2 0 1 0
Mixed-Soft
All > MLLW
0 0 0 0 1 3 0 0
Silt-Sand
All > MLLW
0 0 0 0 1 0 0 0
Salt Marsh
HTL to MHHW
0 0 0 0 0 0 1 0
Open Water
0 0 0 0 0 0 0 0
FEDERAL AVIATION ADMINISTRATION (FAA)

Full table

	Habitat Type	Elevation Zone	Total	Normalized Score	Relative Habitat Function
SITKA SOUND RSA Alternative 5	Rock/boulder	HTL to MHHW	18	0.19	0.29
		MHHW to MLLW	64	0.66	0.76
		MLLW to -30 ft	93	1.00	1.00
		> -30ft	68	0.70	0.70
	Mixed-Soft	All > MLLW	59	0.53	0.66
	Silt-Sand*	All > MLLW	43	0.46	0.56
	Open Water		22	0.24	0.29
AIRPORT LAGOON (Taxiway Alternative 6)	Rock/boulder	HTL to MHHW	2	0.02	0.02
		MHHW to -30 ft	10	0.11	0.10
	Mixed-Soft	All > MLLW	9	0.10	0.10
	Silt-Sand*	All > MLLW	1	0.01	0.01
	Salt Marsh	HTL to MHHW	6	0.06	0.06
	Open Water		2	0.02	0.02

Full table

Full function for each habitat type potentially affected

Habitat Type/ Elevation Zone	Relative Habitat Value: SITKA SOUND (RSAAGOON (Taxiway) Existing Relative Habitat Value	Existing Relative Habitat Value
Rock/boulder		
HTL to MHHW	0.20	0.02
MHHW to MLLW	0.70	0.10
MLLW to -30 ft	1.00	--
>-30ft	0.70	--
Mixed-Soft		
All > MLLW	0.60	0.10
Silt-Sand*		
All > MLLW	0.50	0.01
Open Water*	0.20	0.02

Habitat rated "as good as it gets" in impact area

* None of this habitat type remains in impact area following construction


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